USDA/ARS Research Program in Biobased Products

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Product Quality/New Products & Processes
Agricultural Research Service

Strategic Partnerships Workshop
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National Program Staff

The Agricultural Research Service (ARS) is the principal inhouse research agency of the U.S. Department of Agriculture (USDA).

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ARS National Programs

Animal Production

- Food Animal Production (101)
- Animal Health (103)
- Arthropod Pests of Animals and Humans (104)
- Animal Well-Being and Stress Control Systems (105)
- Aquaculture (106)
- Human Nutrition (107)
- Food Safety (108) (animal & plant products)

Natural Resources

- Water Quality & Management (201)
- Soil Resource Management (202)
- Air Quality (203)
- Global Change (204)
- Rangeland, Pasture & Forages (205)
- Manure & Byproduct Utilization (206)
- Integrated Agricultural Systems (207)

Crop Production

- Plant, Microbial, & Insect Genetic Resources, Genomics and Genetic Improvement (301)
- Plant Biological & Molecular Processes (302)
- Plant Diseases (303)
- Crop Protection and Quarantine (304)
- Crop Production (305)
- Quality & Utilization of Agricultural Products (306)
- Bioenergy & Energy Alternatives (307)
- Methyl Bromide Alternatives (308)

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Mission of NP 306

Enhance the economic viability and competitiveness of U.S. agriculture by maintaining the quality of harvested agricultural commodities or otherwise enhancing their marketability, meeting consumer needs, developing environmentally friendly and efficient processing concepts, and expanding domestic and global market opportunities through the development of value-added food and nonfood products and processes.

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NP 306 Program Components

- Quality Characterization, Preservation, and Enhancement
- New Processes, New Uses, and Value-Added Biobased Products

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NP 306 Resources

- 137 Projects
- 266 SY's
- $75.9M

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ARS Biobased Emphasis

Development of industrial and bioenergy products that expand market opportunities for U.S. agriculture, replace petroleum-based products and other imported strategic materials, and meet environmental needs.

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ARS Investment in Non-Food and Food New Uses Research , FY2001

	$M	Projects	SY*
Non-Food	41.5	65	126
Biofuels	7.1	9	23
Food	40.4	80	133

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*** scientist year**

Customer/Stakeholder Workshops

- Relevance
- Every five years
- NP 306 (Quality/Utilization)
  -May, November, December 1999
- Basis for 5 year research plan

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Stakeholder Priorities for Value-Added Research

- Improved understanding of structure/function relationships
- Quality attribute identification, detection, quantification, and tracking from field to fork
- Phenotypic markers for high value traits
- New value-added biomaterials and co-products
- Products and processes with clear human health benefits

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Stakeholder Priorities for Value-Added Research (Continued)

- **Safer, more environmentally friendly processing technologies and products**
- **Domestic biobased replacements for imports, particularly petroleum**
- **Crops designed with specific end-use traits**

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ARS Emphases

- **Relevance**
- **Quality/Research Excellence**
- **Focus**
- **Coordination**
- **Partnerships**
- **Impact**

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USDA Regional Utilization Research Centers
Established ~ 1940

Albany, CA
New Orleans, LA
Peoria, IL
Wyndmoor, PA

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Current Biobased Activities- Albany, CA

- Improve grain-to-ethanol conversion efficiency by rapid screening of mutant amylase enzymes through directed molecular evolution
- Genetically engineer crops for production of critical materials (castor oil)
- Develop efficient separation technologies for wheat starch and protein for functionality
- Develop wheat biopolymer composites for industrial and food applications

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Current Biobased Activities- New Orleans, LA

- Biocatalytic conversion of soybean oil to industrial drying oils (tung oil)
- Develop environmentally acceptable technologies for separating corn fractions that are cost effective and that add value
- Develop composites for industrial applications using cotton and other natural fibers
- Develop adsorbents from agricultural residues
- Develop epoxies and coatings from sucrose polymers

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Current Biobased Activities- Peoria, IL

- Formulate insecticidal volatile attractants in biodegradable matrices made from modified polymers derived from cereal grains and other natural sources
- Develop biodegradable plastics using modified corn starch and other biopolymers
- Develop complex carbohydrate polymers for food and non-food consumer articles from corn starch and fiber, such as fat replacers, stabilizers, and thickening and viscosity control agents
- Develop functional polymers through enzymatic conversion of carbohydrates in corn

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Current Biobased Activities- Peoria, IL (cont.)

- Develop enzymatic and chemical methods for conversion of fuel ethanol residues into commercially valuable coproducts
- Develop stable starch-oil dispersions (Fantesk) with food, cosmetic and industrial applications
- Generate new or expanded industrial markets for polymers from cereal grains by thermomechanical modification, including steam injection cooking, extrusion and microwaving
- Identify, isolate, modify, and characterize plant proteins suitable for blending with synthetic polymers

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Current Biobased Activities- Peoria, IL (cont.)

- Develop technologies and processes which will impart unique properties to plant proteins, such as for use in adhesives, films, injection molding resins or ion-exchange resins
- Develop pretreatment and fermentation technologies for the conversion of corn fiber and other agricultural substrates into biofuels and value-added fermentation products
- Develop more efficient cellulases and other enzymes for conversion of renewable agricultural biomass into value-added products, including lactic acid

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Current Biobased Activities- Peoria, IL (cont.)

- Provide soybean composition analysis to public soybean breeders in the U.S.
- Chemical modifications of vegetable oils for improved biodiesel properties, soy inks, and lubricants
- Biocatalytic conversion of vegetable oils to value-added products (chemicals, mulch, sunscreen, antifungals)

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Current Biobased Activities- Wyndmoor, PA

- Develop new valuable food and industrial products from plant polysaccharides, corn and other grains
- Improve process efficiencies and otherwise reduce costs of the corn-to-ethanol conversion, including through development of valuable coproducts
- Bioconversion of fats and oils to value-added biopolymers, biosurfactants, and biodiesel

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Current Biobased Activities- Athens, GA

- Enhance value of fiber commodities (flax, kenaf, cotton) through microbial and enzymatic activities

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Current Biobased Activities- Madison, WI

- Develop fuels, construction materials, and consumer products from alfalfa and manure through fractionation and processing.

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FY 2001 ARS Program Enhancements ($1.9M)

- Wyndmoor, PA- Convert surplus agricultural commodities and their carbohydrate-rich processing byproducts into biobased industrial products and high-valued functional food ingredients.
- New Orleans, LA- Convert animal biosolids and other agricultural residues to value-added products such as engineered soils, ornamental horticulture fertilizer, and activated carbon.
- Albany, CA- Develop new uses for cereal crop residues, such as biodegradable packaging materials, fiber-based building materials, nanocomposites, and rice paper products from rice and wheat straw.

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FY 2001 ARS Program Enhancements ($1.9M) (continued)

- Winter Haven, FL- Develop stabilized bioabsorbents and other industrial products from citrus peel pectin.
- Peoria, IL- Develop new enzyme technologies to efficiently and economically convert agricultural biomass to fermentable sugars and value-added coproducts.

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FY2002 ARS Emphases

- Improving conversion of agricultural biomass to ethanol through discovery and development of more efficient microorganisms and enzymes, reducing costs by developing valuable coproducts, and improving biodiesel fuel quality.
- Developing biobased materials (absorbents/adsorbents, lubricants, plastics, polymers, composites, coatings, adhesives, biosurfactants) from agricultural commodities and byproducts using biotechnology, biocatalysis and other integrated technologies
- Increasing knowledge on fundamental biomaterials science leading to development of new processing technologies and new products

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FY2002 ARS Emphases

- Expanding development of novel crops for value-added products, including natural rubber products, new fiber products, and new biodegradable detergents
- Improving biomass for energy through genetic modification of biomass crops to facilitate conversion and improved methods for sustainable production, harvesting, handling, and storing biomass

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ARS National Programs Website

http://www.nps.ars.usda.gov/

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